FRANKFORD ARSENAL

A PROPOSAL FOR THE

DEVELOPMENT OF A WIRE GUN

by

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JUNE 1960

PHILADELPHIA 37, PA

REPORT P60-5-1

A PROPOSAL FOR THE DEVELOPMENT OF A WIRE GUN

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JUNE 1960

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ABSTRACT

A wire gun is proposed for a variety of military applications. The gun is composed of high tensile steel wire coiled under tension so that when released it extends or uncoils. An improved version would consist of the basic coil supplemented by a propellent-actuated mass to improve its accuracy and range.

Some of the applications presented show the wire gun used as standard field equipment for suspension bridge building, communications, rescue, escape, antipersonnel and target entanglement. An application for the wire gun as an antimissile diffuser is also shown.

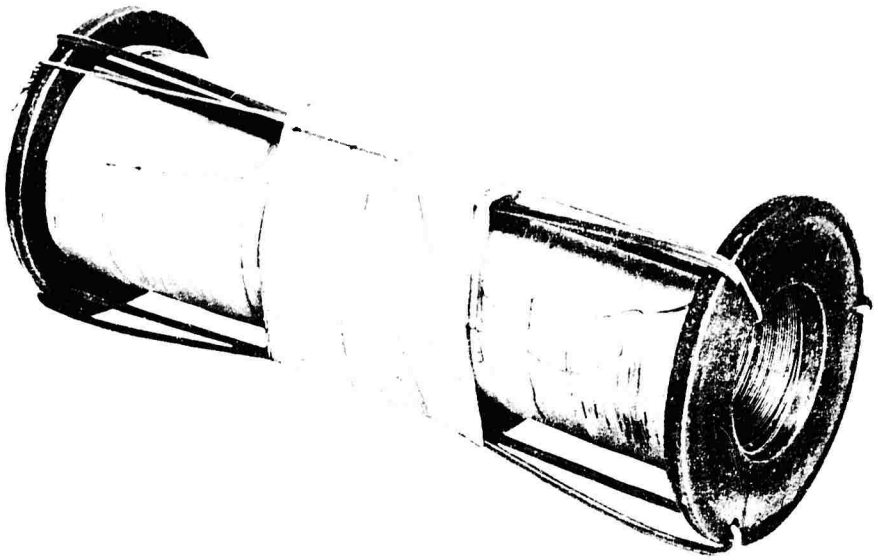

Figure 1. Wire Gun, Self-Actuated Type, Side View

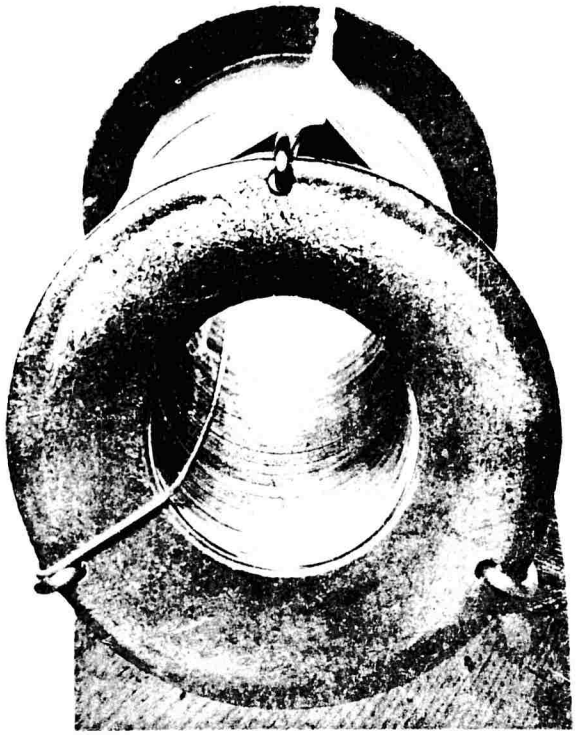

Figure 2. Wire Gun, Self-Actuated Type, Front View

INTRODUCTION

Studies conducted at Frankford Arsenal in cooperation with the American Chain and Cable Company of Adrian, Michigan have evolved a device which has indicated potential for a variety of military applications. This device or gun is a package of high tensile steel wire coiled under tension so that when it is released it extends itself (unwinds)using internal energy stored as a result of the winding process. The wire extends approximately along a straight line coincident with the axis of the coil. Improved models consist of the basic coil containing the built-in energy characteristics aided by a propellant-actuated mass which improves both accuracy and range.

Initial work was aimed at determining the feasibility of utilizing a small-diameter wire as a means of imparting intelligence to a fired projectile. Later explorations showed that other uses of military value could be made of this unique device. Since there is no stated military requirement for this item, the following descriptions and concepts are offered primarily as suggestions.

DESCRIPTION

The gun which served as a test vehicle is essentially a coil of wire which has been wound under tension similar to winding a coil spring. Tension is gauged so that the wire is not permanently-set during the winding process and upon release will unwind itself opposite to the direction that it was wound.

Figures 1 and 2 are photographs of one of the original experimental wire devices. Figure 3 is a typical cross section through such a coil showing the wire layers. The coil is capable of extending itself upon release of the open end of the inner layer. No actual measurements of wire velocity have been taken since the coil samples have been few, but an indication of velocity can be surmised from the following.

A coil weighing 2 pounds extended 2000 feet of 0.019-inch diameter wire in approximately 10 seconds indicating an average velocity of 200 fps. Velocity will, of course, be dependent on wire material, wire diameter, coil diameter and winding tension.

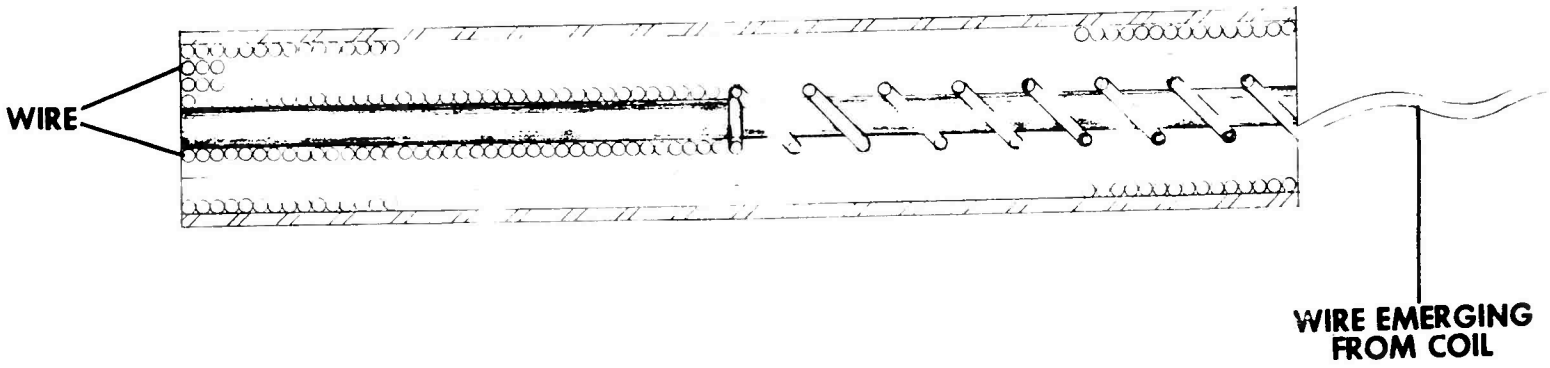

Figure 3. Wire Gun, Self-Actuated Type, Cross-Section

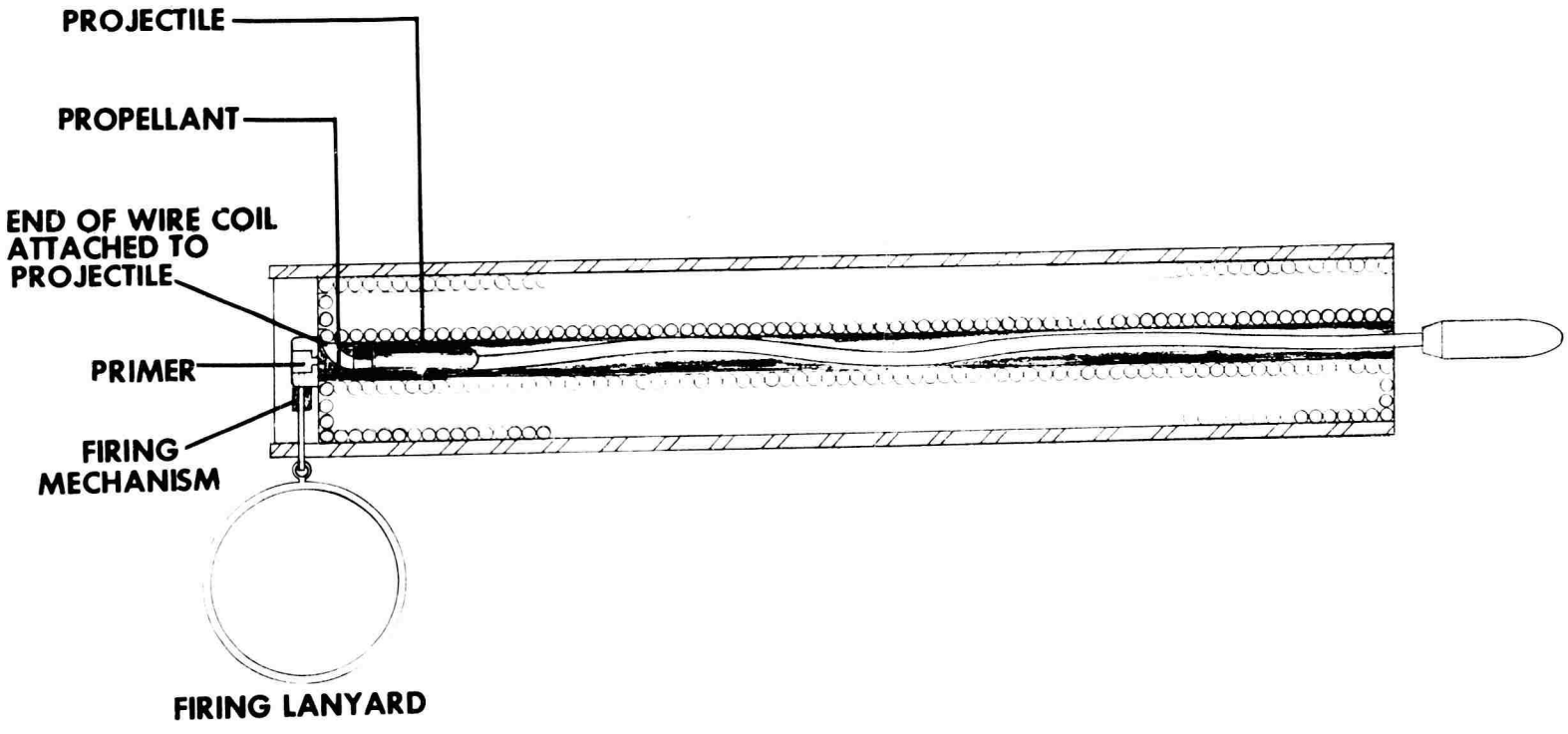

Figure 4. Wire Gun, Propellant- Actuated Type, Cross-Section

The following concepts consider not only a device which is capable of operation purely from the internal energy stored in the coil, but also a device shown in figure 4. This version of the wire gun utilizes a projectile or mass which is propellant actuated and provides a point-fire leader for the wire. Utilization of the cartridge will allow the gun to be used with a greater degree of accuracy at longer ranges.

DEVELOPMENT APPROACH

The majority of concepts presented in this brief development proposal have considered wire guns which are basically limited to one (small) size.

Feasibility studies would include the following factors prior to initiating development of components.

1. Optimum wire diameter for intended use.

2. Determination of velocity with respect to coil size, wire diameter, winding tensions, etc.

3. Deterioration of built-in energy based on shelf-life studies.

4. Materials best suited for specific applications.

5. Determination of ballistic conditions for the PAD type wire guns.

6. Safety aspects.

7. Other uses.

Follow-up studies will include consideration of packages having larger weight and bulk and which would serve other purposes than those illustrated.

Development of these items would consider applications requiring greater forces and consequently wire of larger diameter. Component development would not be initiated until one or more of the concepts were chosen as worthy of development. Best features determined from the feasibility studies would then be incorporated. The finished product will undergo development testing until adequate for use.

FY 61 would be devoted entirely to the feasibility studies pertaining to the entire field and component development of one item in order to insure a maximum degree of success; FY 62 plans include engineering testing and user testing of a selected item. (See Appendix.)

Development schedules consider the full field of application during the feasibility study phase and, of necessity, would only consider one of the items for continued development and testing. Additional pursuit of the other concepts would necessitate an increase in both RAD and T&E funds and could be carried on concurrently.

WIRE GUNS AS FIELD EQUIPMENT

A foot soldier could be equipped with several wire guns as standard field gear (fig. 5). With such equipment the soldier can perform a variety of activities heretofore impossible without the use of specialized equipment. He can reach inaccessible positions by shooting the wire over a highly placed protrusion and attaching heavier rope or cable to the end, thereby enabling him to climb to the higher position. He is afforded means for linking communication points over distant location; rescue, escape, and support missions are facilitated; and numerous other maneuvers are also made possible.

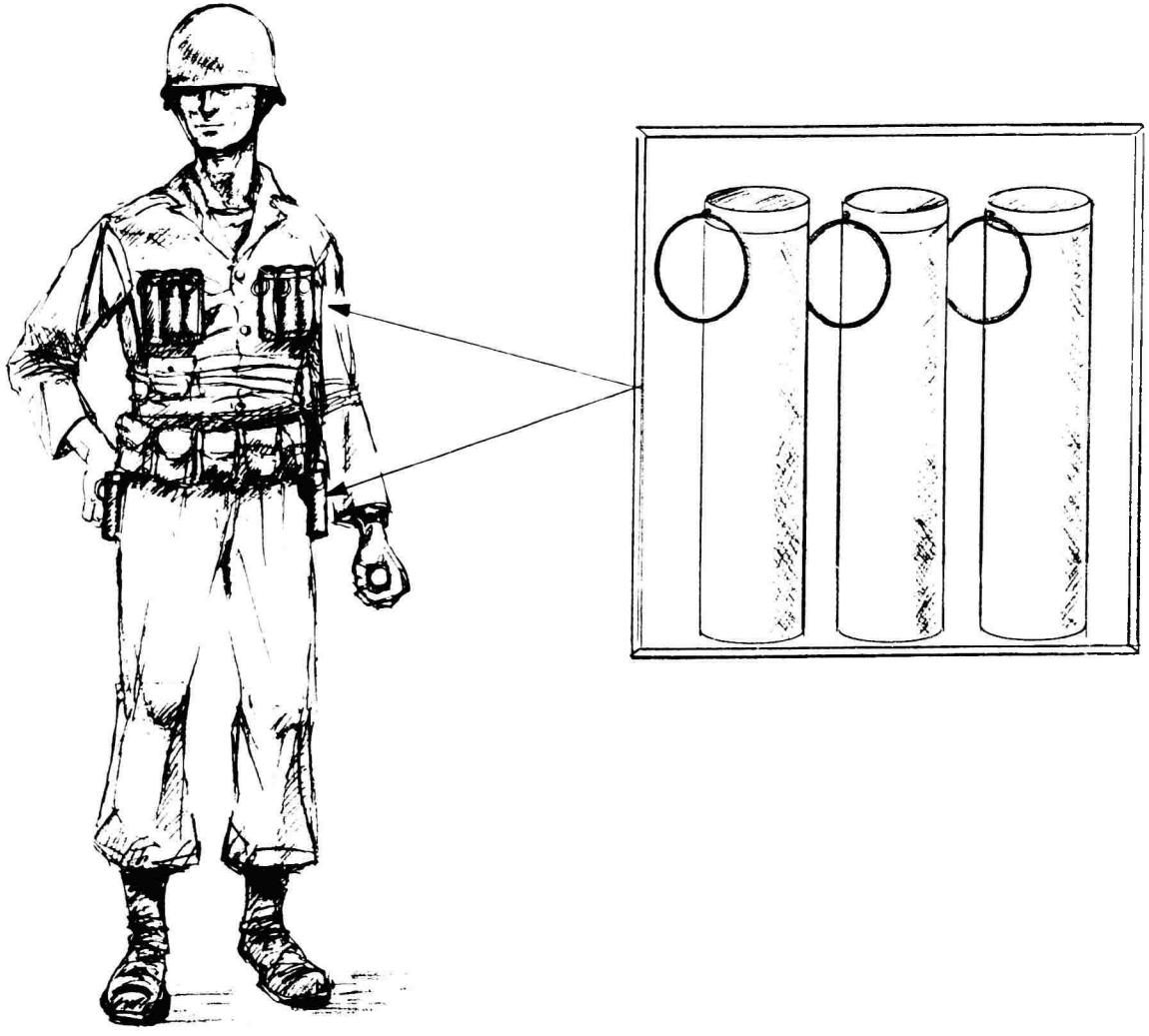

Figure 5. Wire Gun Used as Field Equipment

INITIATOR FOR SUSPENSION BRIDGE BUILDING

Unfordable rivers or deep canyons and crevices could be spanned by means of the wire gun (fig. 6). In this application the wire is propelled from one bank of the river over and across to the opposite bank. When the initial span is made, heavier wire or rope is secured to the lighter wire and is pulled across the span. Materials necessary for erecting a suspension tower and cable anchors are then hauled across by means of the heavier rope. This application affords the use of basic equipment for establishing bridges or crossings without recourse to special vehicles or helicopter lift for linking inaccessible locations.

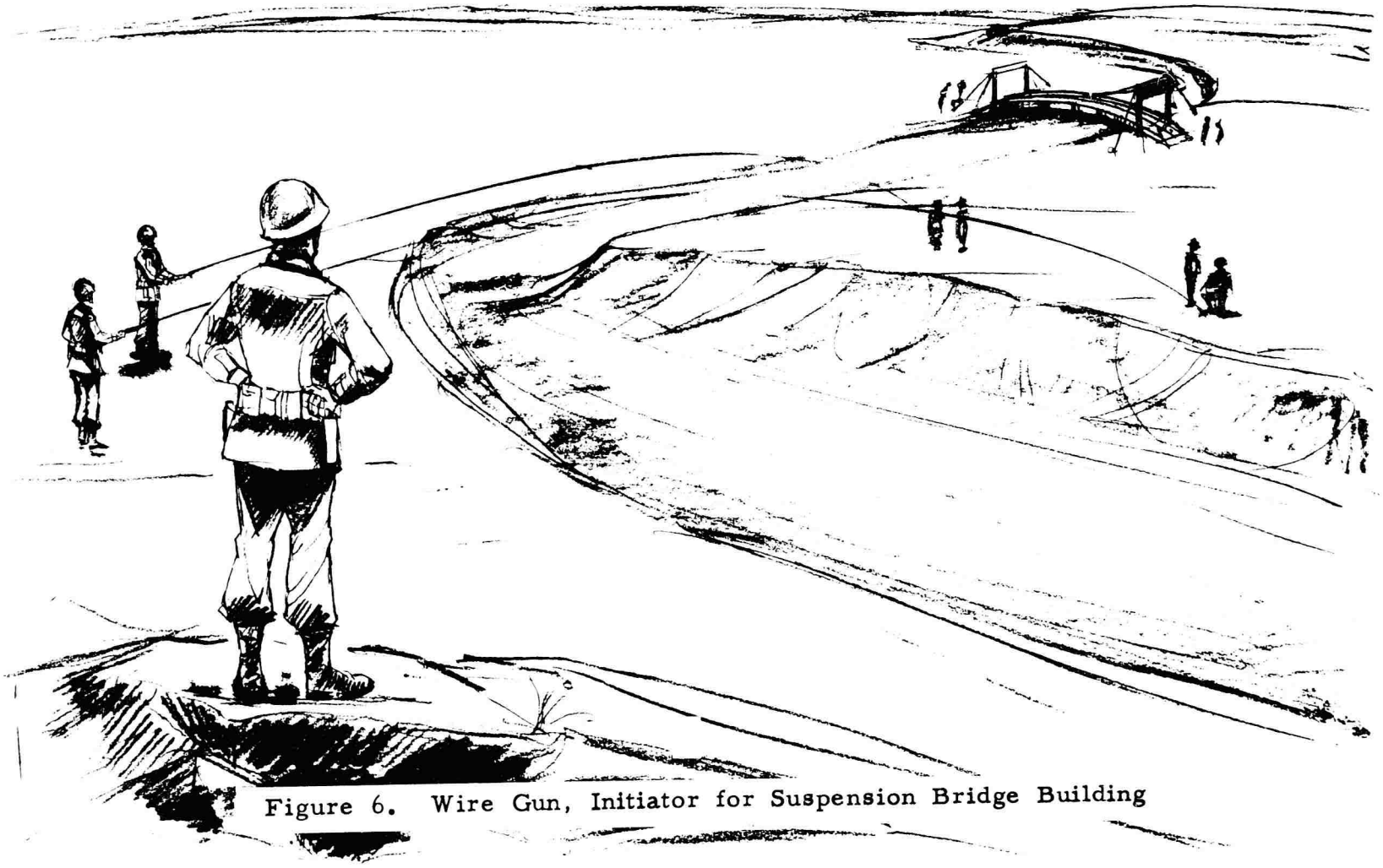

Figure 6. Wire Gun, Initiator for Suspension Bridge Building

In this application, a special insulated type of wire could be propelled to a point within its effective range over all types of terrain (fig. 7). Multilead conductors can be accomplished by coating the high-tensile steel wire with insulating material in successive circumferential layers over which conducting materials could be plated. This would make possible an efficient method of establishing battlefield telephone or signal centers. The wire gun could also be used as a leader which in turn could be used to lay or pull standard communication wire where desired.

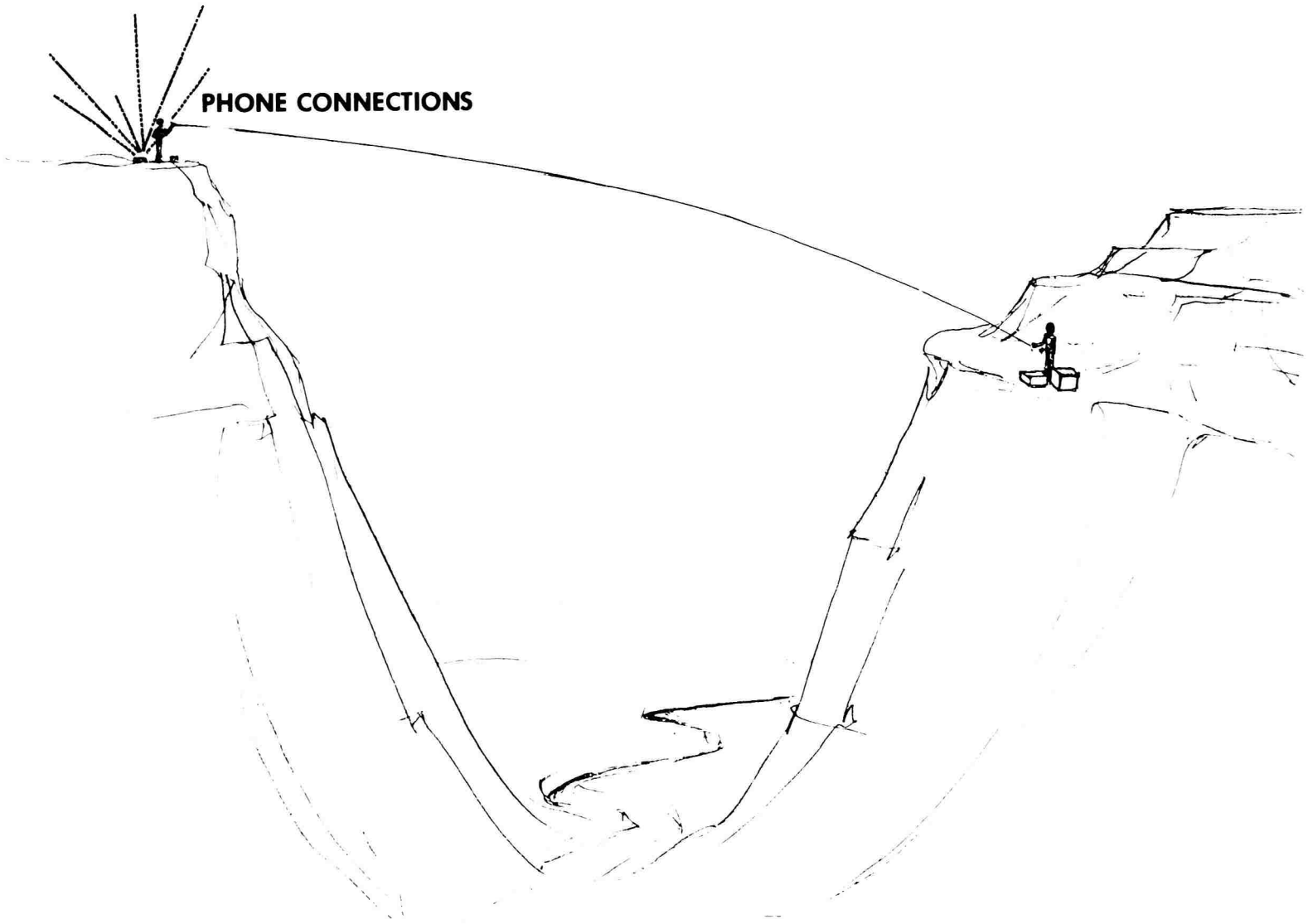

Figure 7. Wire Gun, Communications

Figure 8 depicts a method for scaling a wall or bluff using the wire gun. The technique demonstrated is as follows:

The wire is fired over or around a tree, flagpole or similar protuberance high on a cliff or building so that the end returns to the ground. A heavy rope is attached firmly to one end of the wire and drawn around the tree or anchoring object by withdrawing the wire. The rope is attached firmly to the ground and then used to scale the obstacle.

This application of the wire gun could be used to rescue a man stranded on a roof, cliff, or ledge. The wire would be fired to establish contact and the tactics described above would be used except that the trapped man would withdraw the wire and thus draw the rope. The rope would be secured and the obstacle descended or scaled as required.

Figure 8. Wire Gun, Ranger Tactics

REMOVING ENTANGLEMENTS

The removal of entanglements such as barbed wire, nets or fences could be easily and safely accomplished by use of the wire gun equipped with a grapple hook which could be launched into the entanglement permitting its removal by dragging or towing the obstacle from the area (fig. 9).

Figure 9. Wire Gun, Removing Entanglements

The entanglement of a target could be accomplished by applying intermittent tensions to the wire while being loaded into the launcher. At close ranges the wire would be highly effective if a leader were spun using a rifled tube imparting undular gyrations to the fast-moving wire. Further, pretensioned barbs can be built into the coil to obtain the antipersonnel effect shown in figure 10.

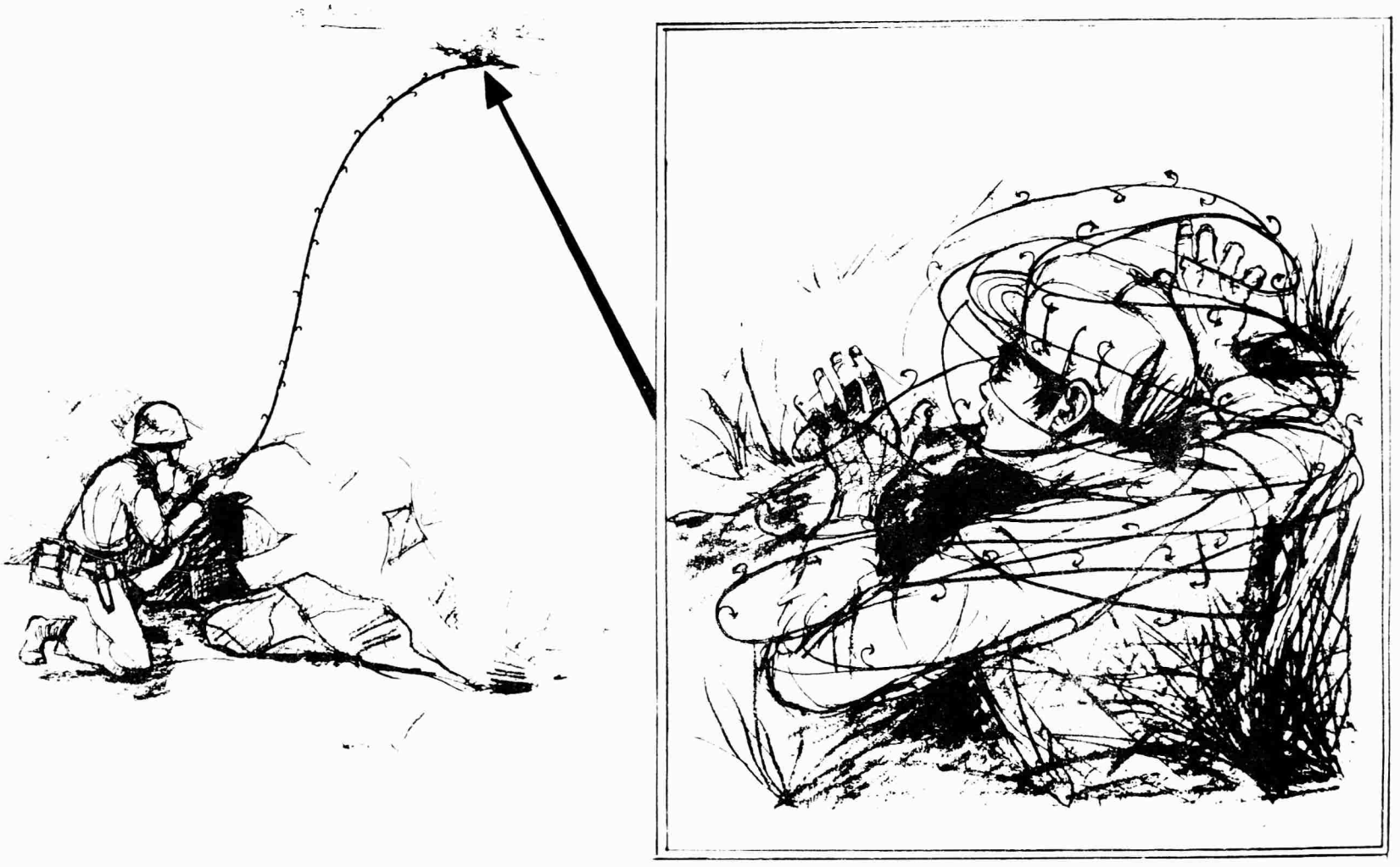

Figure 10. Wire Gun, Antipersonnel Use

RANGE MEASURING DEVICE

As a measuring device, the wire gun could be used for map making, range measurement and similar activities. Tension could be applied to the wire while being wound so that an accurate reading could be obtained from a counting device incorporated into the system (fig. 11).

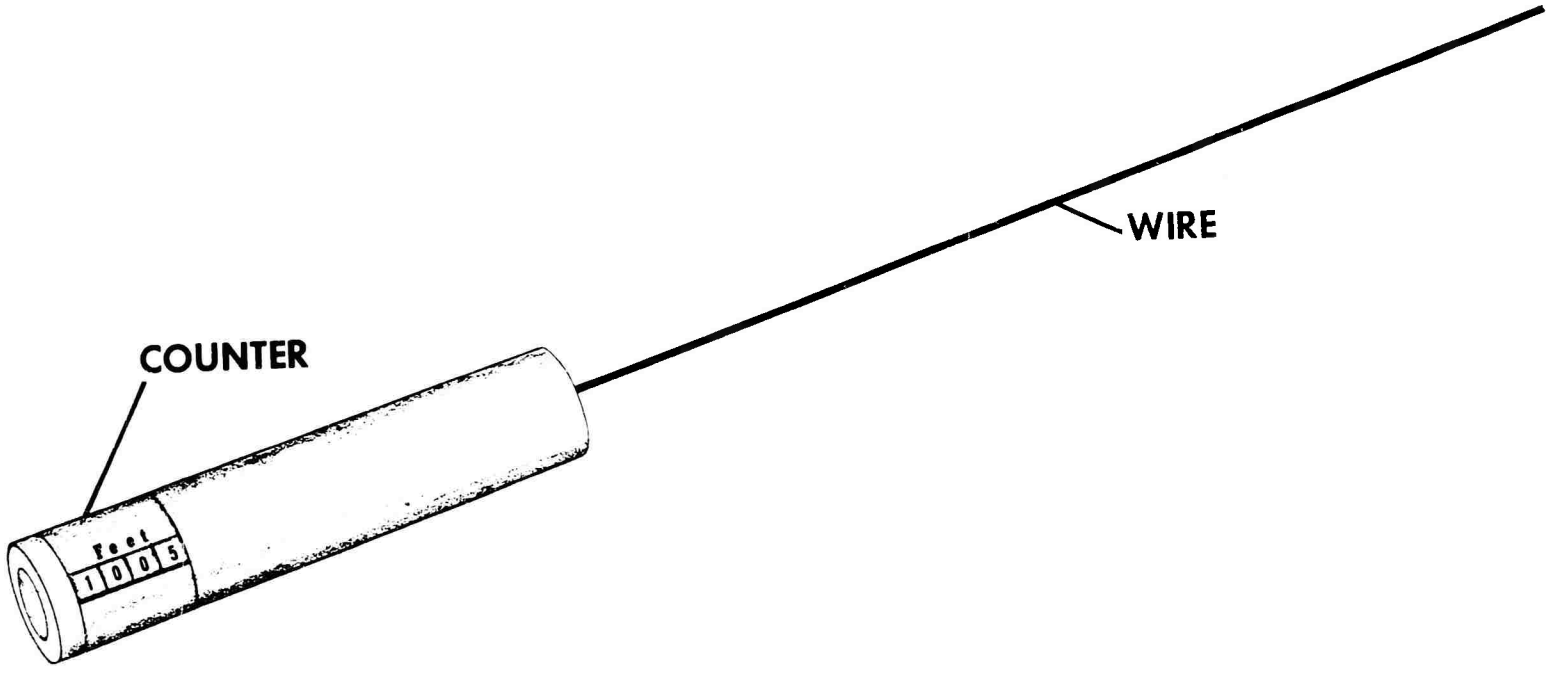

Figure 11. Wire Gun, Range Measuring Device

ANTIMISSILE DIFFUSERS

Considerable interest has been shown in using the principles of the wire gun as a means of confusion for hostile ground-controlled missiles.

One such scheme considers a multiplicity of devices installed in a nose cone of an antimissile which are ejected on ground command (fig. 12). These devices would feed lengths of wire or in turn carry out effective radar diffusers such as aluminum foil.

Another application as a diffuser would be in space-satellite decoys employing the wire device similar to that described for the antimissile missile.

A further application would be the ejection of a "net" or tangle of heavy wire from an antimissile missile (or other means) as a means of entangling or stopping a missile or fast plane. This could be developed into an Air Defense Weapon.

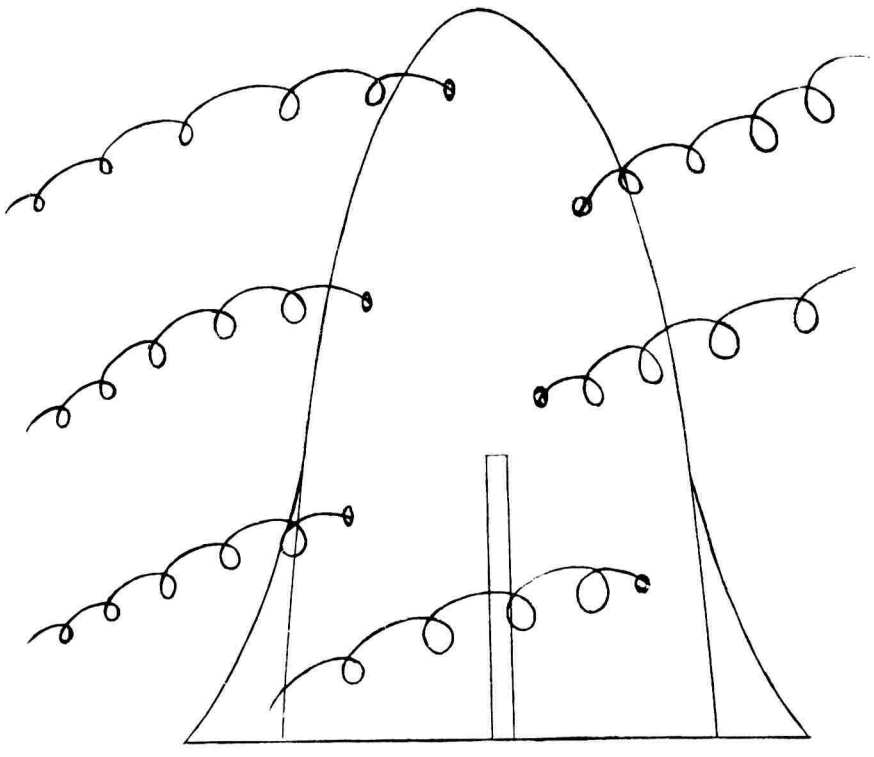

Figure 12. Wire Gun, Antimissile Diffusers

Another application of the wire device would be as a means of grounding the static electricity from helicopters and similar aircraft prior to their actual landing (fig. 13).

This could be accomplished by firing a suitable wire from the device at an altitude low enough to reach the ground with certainty. Allowing the wire to trail on the ground while landing, or while discharging cargo or passengers would insure no static electricity building up again.

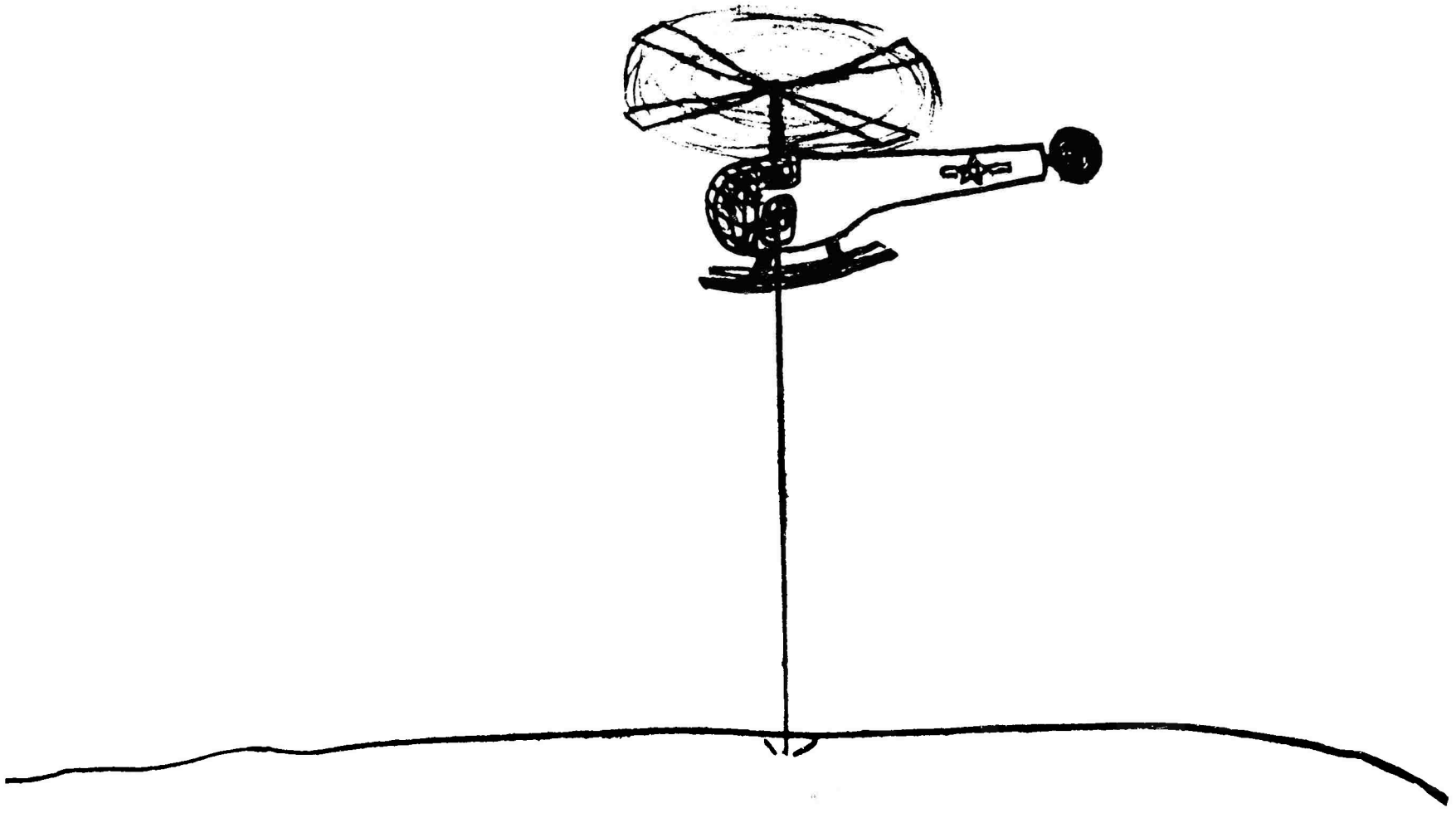

Figure 13. Grounding Means for Aircraft

APPENDIX

DEVELOPMENT SCHEDULE AND COSTS

Completion of this program is planned according to the following development schedule. The schedule represents the general areas of concentration which are deemed necessary at this time.

	FY 61												FY 62											
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
Feasibility Studies (FS)	X	X	X	X	X	X																		
Engineering Design (ED)				X	X	X	X	X																
Component Development (CD)							X	X	X	X	X	X	X	X	X	X	X	X						
System Demonstration (SD)												X												
Engineering Tests (ET)																			X	X	X			
User Tests (UT)																					X	X	X	X

RAD FUNDS REQUIRED	$200,000
T&E FUNDS REQUIRED	$ 25,000
TOTAL	$225,000

$100,000
$375,000
$475,000